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The Deployment of Electronic Business Processes in Canada

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.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published

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Abstract

It is widely acknowledged that information and communications technologies (ICTs) have led to major innovations in business models and play an important role in firms' competitiveness and productivity.

Because of the lack of statistics, however, there have been few Canadian studies of the deployment of electronic business (e-business) processes within firms. E-commerce was one of the first online activities to attract attention, and we now know a little more about it, yet e-commerce is just one of the many business processes supported by Internet-based business networks. In Canada, very little information is available about how ICTs are used to manage operating processes such as the logistics functions of delivery and inventory management and the marketing and client relations functions.

In 2007, the Survey of Electronic Commerce and Technology collected data for the first time on the deployment of Internet-based systems to manage various e-business processes. The Survey also asked firms about the internal and external integration of the systems that manage those e-business processes.

Based on these new data, the study begins with a description of e-business adoption in Canada and then explores the benefits that firms see in doing business over the Internet. This study provides a clearer picture of how Canadian firms are deploying e-business processes, broken down by industry, size and type of e-business use.

The Deployment of Electronic Business Processes in Canada

by Sylvain Ouellet

1 Introduction

It is widely acknowledged that information and communications technologies (ICTs) have led to major innovations in business models and play an important role in business competitiveness and economic productivity.

Analysts have been studying the trends in ICT adoption by Canadian firms for some time. For example, in 2002, Statistics Canada published a study that examined selected basic indicators of e-commerce and ICT use by Canadian businesses (Charles, Ivis and Leduc 2002). The study focused on indicators of Internet access, e-mail use, Web presence, and online buying and selling. These statistics have made it possible to monitor trends, particularly in e-commerce.[1] For example, in general, small businesses lag behind larger firms in their use of e-commerce.

However, there have been few Canadian studies of e-business deployment within firms, due to the lack of measures in this area. E-commerce is just one of the many business processes supported by Internet-based business networks. For example, firms develop Internet-enabled initiatives to strengthen online connections with customers, improve customer services and manage inventory via electronic links with their customers and/or suppliers (Zhu, 2004). According to some researchers, those e-business processes have had just as big an impact on firms' competitiveness and productivity as e-commerce has.

In 2007,[2] the Survey of Electronic Commerce and Technology collected data for the first time on the implementation of Internet-based systems to manage certain processes related to logistics, marketing and customer relations. The survey also asked firms about the internal and external integration of systems related to those e-business processes. This study is largely based on these new measures.

The study begins with a description of e-business adoption in Canada and then explores the benefits perceived by firms from conducting business over the Internet. The study provides a clearer picture of how Canadian firms are deploying e-business processes, broken down by industry, size and type of e-business use.

2 Definitions and Concepts

2.1 Electronic business

The first challenge is to define what is meant by electronic business, or e-business.[3] For some researchers, e-commerce and e-business are one and the same. For others, e-commerce is just one specific application of business over the Internet, covering only its transactional aspect (Clayton and Goodridge 2004). In its broadest sense, Internet-based e-business also encompasses the use of ICTs in business processes such as marketing, customer relations and logistics.[4]

1. SECT uses the OECD E-commerce definition which includes online buying or selling, either from business-to-business or business-to-consumer (OECD 2005).
2. The Survey of Electronic Commerce and Technology was last conducted in 2007, the most recent year for which Statistics Canada has data on e-commerce and e-business.
3. Although ICTs and e-business can be supported on various types of networks, this study focuses on Internet-based networks.
4. One way of looking at e-business processes is through Porter's value chain model (Porter 1985 and 2001). E-commerce, logistics processes and marketing and customer relations processes are all part of specific processes in the chain.

2.2 Electronic business processes

For the purpose of this study, an e-business process is defined as "a core business process operationalized by the structured exchange and management of information over networks using Internet architecture. These systems are also referred to as Internet business solutions. The network can be open (e.g. accessible to everybody through the Web) or closed (e.g. accessible only to your employees or suppliers on a LAN or WAN)." To differentiate between firms on the basis of their level of e-business sophistication, this study makes a distinction between e-commerce and other e-business processes.

In this study logistics-related e-business is defined as the use of Internet-based systems to manage logistics functions. Similarly, e-business associated with customer relations is defined as the use of Internet-based systems to manage the marketing and customer relations functions.

2.3 Integration of e-business processes

This study also examines the integration of e-business processes internally and externally. Internal integration is defined as automatic links[5] to back-end systems (accounting, billing, inventory control) within the company. External integration is defined as automatic links to customers' or suppliers' systems.

Note to readers

The Survey of Electronic Commerce and Technology (SECT) collected information on the use of information and communications technologies (ICTs) and electronic commerce in the private and public sectors between 2001 and 2007. Results are based on a sample of about 19,000 businesses in every industry except agriculture. The survey did not include firms with very low revenues. Depending on the industry, the exclusion threshold was usually between $100,000 and $250,000. Data for reference year 2007 are used in this study.

The survey sample covered industries described in the North American Industry Classification System (NAICS) 2007 (Statistics Canada, 2007). This report presents results at the highest level, which divides the economy into 20 sectors.

The SECT also collected information on the number of full-time-equivalent (FTE) employees, so that firms could be classified by size. It is recognized that company size (small, mid-sized or large) is related to the industry and that firms regarded as large in some industries may be considered small in others. Data quality and confidentiality constraints make it impossible to classify firms by size for each industry. For the purposes of this report, however, two broad industry groups are used:

Manufacturing industries	**Full-time-equivalent employees**
Small	0 to 19
Mid-sized	20 to 499
Large	500+
Other industries	
Small	0 to 19
Mid-sized	20 to 99
Large	100+

It should also be noted that to improve data quality, the mid-sized and large company categories were combined in some sections of the study.

(Firms with no FTEs may have only self-employed workers or may be seasonal or virtual firms.)

5. A link is considered automatic when information input to one system produces an update in another system or is available in real time in other systems.

3 E-business logistics and customer relations

The 2007 SECT survey asked Canadian firms if they used an Internet-based system to manage certain logistics and customer relations functions. The following logistics functions were considered:

- Inventory management;
- Organizing deliveries to customers;
- Organizing deliveries from suppliers;

The following customer relations functions were specified:

- Collecting customer (or visitor) information online to build a customer (visitor) database;
- Providing users with the ability to customize the information they see when entering the system;
- Providing online after-sales support for customers.

The above-mentioned logistics functions are often associated with the concept of supply chain management (SCM). Though it can be defined in various ways (Gibson et al. 2005; Mentzer et al. 2001), SCM can be seen as the integration of all activities associated with the flow and transformation of goods from the raw materials stage through the end user, as well as the associated information flows by improved supply chain relationship (Handfield and Nichols 1999).

SCM can have a number of goals, such as cutting costs, improving service, improving communication and interaction between partners in the supply chain, and enhancing delivery flexibility and response time. The use of Internet-based systems to manage value-chain functions is attractive in theory because it provides an opportunity for firms to move toward what some experts call the "extended enterprise" model. Such a model has the potential to add value to the value chain in general (Ranganathan et al. 2004).

With regard to customer relations, in practice the systems used to manage such functions often refer to what is known as customer relationship management, or CRM. CRM systems help to manage interactions with customers. For example, information about those interactions is captured and then used to build forecasting models that help to anticipate customer requirements.

Internet-based CRM deployment can improve the quality of data collected from customers and enhance forecasting accuracy. This can result in a better relationship between the company and its customers (Butler 2000).

The SECT data on e-business processes for logistics and customer relations can be used to assess the extent to which Canadian firms are using the Internet to deploy important SCM and CRM functions. The data can also be used to determine whether systems integration is a widespread e-business practice.

The results show that in 2007, 11% of private-sector firms used e-business for logistics, while the same percentage of firms used it for customer relations (Table 1). Proportionally more large and mid-sized businesses than small businesses used e-business for logistics and customer relations.

Table 1
Private-sector firms using e-business for logistics and customer relations, Canada, 2007

	E-business			
	Small	Medium	Large	Total
	percent			
Logistics functions	10	21	22	11
Marketing and customer relations functions	10	19	32	11

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

Detailed results for each e-business logistics and customer relations functions measured are presented in Table 2. Of the three logistics functions measured, Internet-based systems were used by 4% of firms to manage their inventory, by 6% of firms to organize deliveries to customers and by 7% of firms to organize deliveries from suppliers. For each of those functions, the adoption rate was twice as high for large firms as for small ones.

For customer relations, the function most commonly reported by private-sector firms was the online collection of information about customers (or visitors) to build a customer (visitor) database (8% of firms reported using an Internet-based system to manage that function). It is worth noting that 22% of large firms collected customer information in a database.

Table 2
Private-sector firms using e-business for logistics and customer relations functions, Canada, 2007

	E-business			
	Small	Medium	Large	Total
	percent			
Logistics functions				
Inventory management	5	9	10	4
Organizing deliveries to customers	5	12	13	6
Organizing deliveries from suppliers	7	12	14	7
Customer relations functions				
Collecting customer (or visitor) information online to build a customer (or visitor) database	7	14	22	8
Providing users with the ability to customize the information they see when entering the system	3	7	16	4
Providing online after-sales support for customers	5	9	17	5

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

While the e-business adoption rate for logistics was just over one in ten firms in Canada in 2007, some industries had higher adoption rates than others. The rate in the information and cultural industry and the retail trade industry was above 20%. Just below the 20% threshold were wholesale trade (19%), manufacturing (18%) and utilities (17%) (Table 3).

The adoption rate for logistics was fairly high in manufacturing, wholesale trade and retail trade because of the key role that the supply chain plays in their business model. In the information and cultural industries, there are many firms whose products can be digitized and delivered online. That sector also led in online buying and selling (Statistics Canada 2008).

With respect to the use of e-business for customer relations, some industries are worth noting: 37% of firms in the information and cultural industries used e-business for this purpose, as did 34% of firms in the educational services sector. Those industries often do business with individual consumers, and their business model lends itself to the use of a website to inform, attract and serve customers. They were also among the industries that had the most firms with a Web presence (Statistics Canada 2008).

Table 3
Private-sector firms using e-business for logistics and customer relations, by industry, Canada, 2007

	Logistics functions	Marketing and customer relations functions
	percent	
Agriculture, forestry, fishing and hunting	1	2
Mining and oil and gas extraction	6	12
Utilities	17	17
Construction	7	10
Manufacturing	18	18
Wholesale trade	19	16
Retail trade	22	14
Transportation and warehousing	10	7
Information and cultural industries	23	37
Finance and insurance	11	16
Real estate and rental and leasing	5	11
Professional, scientific and technical services	10	11
Management of companies and entreprises	10	7
Administrative and support, waste management and remediation services	9	12
Educational services	9	34
Health care and social assistance	8	6
Arts, entertainment and recreation	10	16
Accommodation and food services	12	8
Other services (except public administration)	7	7
All industries	11	11

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

4 Integration of Internet-based e-business systems for logistics and customer relations

An important element of e-business is the capability to establish automatic links between different systems using electronic or computerized tools so that the various systems can be integrated. Although firms use a number of electronic tools to achieve systems integration, such as traditional EDI, this study focuses on Internet-based systems. Internet use is becoming more and more attractive, and as some researchers have pointed out, many large firms are developing Internet-based initiatives to strengthen customer relations, disseminate product information, facilitate transactions, improve customer services and support systems integration (Zhu 2004). Hence, systems integration is central to what some call the "extended enterprise". It is also important internally, as exchanges between systems within a company can make for more effective sharing of company information. One example of this would be the integration of a company's inventory system with its billing system. The diversity of automatic links a company can create is often regarded as an indicator of the sophistication of its e-business systems. In theory, the integration of e-business processes should make firms more efficient, more productive and more profitable (Clayton and Goodridge 2004; Frohlich and Westbrook 2002).

Note to readers

In this study, mention of firms that integrate their systems internally or externally or outsource their e-business processes (logistics or customer relations, as the case may be) always refers to the proportion of firms that reported doing e-business, and not to the total population of firms.

Of the firms that reported using e-business processes for logistics and customer relations, 44% and 36% respectively stated that at least one of their Internet-based systems for this type of e-business was integrated internally or externally (Table 4).

It is also noted that a greater proportion of large firms than small firms had integrated e-business systems. The same was true for mid-sized firms in comparison with smaller firms. For example, 59% of large firms linked the e-business systems they use for logistics to other systems (internal or external), compared to 40% of small firms.

Table 4
Firms integrating Internet-based e-business systems used for logistics and customer relations, Canada, 2007

	E-business			
	Small	Medium	Large	Total
	percent			
Logistics functions	40	56	59	44
Marketing and customer relations functions	34	39	65	36

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

Table 5 shows the situation for selected industries. The majority of firms in finance and insurance (82%), accommodation and food services (59%) and retail trade (53%) had integrated e-business logistics systems. This was the case for less than half of the firms in other industries.

In the case of customer relations, less than 50% of firms in each industry shown had integrated systems for that purpose. In other words, the systems used seemed to operate independently in the majority of cases.

Table 5
Firms integrating Internet-based logistics and customer relations systems, selected industries, Canada, 2007

	Logistics functions	Marketing and customer relations functions
	percent	
Information and cultural industries	44	40
Educational services	9	40
Manufacturing	36	30
Accommodation and food services	59	34
Educational services	20	49
Finance and insurance	82	42
Arts, entertainment and recreation	F	31
Wholesale trade	43	39
Construction	23	33
Retail trade	53	37
Transportation and warehousing	45	49

Note(s): The leading industries in adopting e-business processes for logistics or customer relations were selected, and other industries were added.
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

Details concerning the types of automatic links used are presented in Table 6. The two most common types of automatic links for logistics functions were links to back-end systems within the organization and links to suppliers' systems. In both cases, the adoption rate was 26%. Automatic links to customers' systems were less widespread (12%). With respect to the proportions by company size, the majority of large firms had automatic links between the Internet-based e-business logistics systems and internal systems. While there are a number of possible explanations, the adoption of enterprise resource planning (ERP) applications by large firms may be a contributing factor. The main feature of such systems is that they provide a significant degree of integration between the various systems used to manage the company's internal business processes. ERP software developers originally targeted large firms for the adoption of such systems, which may account for part of the difference between large and small firms.

Automatic links to back-end systems within the organization are usually the most prevalent for customer relations purposes. Nearly one-third (32%) of the firms that used e-business processes for customer relations had such internal links. It is noteworthy that 63% of large firms using such processes integrated the systems that manage

them internally. External automatic links are less common. Of the firms with e-business processes for customer relations, 11% had automatic links to customers' systems, and 12% had automatic links to suppliers' systems.

Table 6
Firms integrating Internet-based e-business systems used for logistics and customer relations, detailed, Canada, 2007

	Firms			
	Small	Medium	Large	Total
	percent			
Automatic links between Internet-based logistics systems and other systems				
Back-end systems (internal)	22	36	52	26
Customers' systems (external)	12	12	20	12
Suppliers' systems (external)	25	29	30	26
Automatic links between Internet-based customer relations systems and other systems				
Back-end systems (internal)	29	35	63	32
Customers' systems (external)	11	8	19	11
Suppliers' systems (external)	11	13	13	12

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

Studies from other countries have also observed a relatively low integration of logistics management systems in small firms compared with larger ones. For example, the British Department of Trade and Industry raised this issue through a study by Harland et al. (2007). According to the study, the lack of integration in small and mid-sized firms can be explained as follows: small firms tend to be more cautious about investing in e-business logistics processes, and an important factor in integrating their systems (especially externally) was the influence of a dominant customer. The authors also point out that small firms have difficulty seeing the benefits of adopting e-business processes and integrating their systems.

5 Outsourcing e-business processes

In an effort to cut costs and increase efficiency, some firms choose outsourcing as a means of facilitating the transition to e-business. They do not necessarily have all the infrastructure or know-how to use e-business for logistics or customer relations, which makes outsourcing an option for them.

A number of surveys have looked at the general topic of outsourcing by businesses, especially in Canada. One of the findings of these surveys is that over the last 40 years, outsourcing in general has grown substantially in Canada, particularly in service industries (Baldwin and Gu 2008).

What is the situation with regard to e-business processes for logistics and customer relations?

The SECT 2007 contained some specific questions on the outsourcing of e-business processes. The data show that 12% of Canadian private-sector firms outsourced e-business logistics or customer relations functions (Table 7). At a more detailed level, 10% of firms did so for logistics functions, and 13% for customer relations functions.

Table 7
Firms outsourcing e-business processes, Canada, 2007

	Firms			
	Small	Medium	Large	Total
	percent			
Private sector, all industries	11	15	32	12
Functions				
Logistics	9	12	23	10
Marketing and customer relations functions	11	15	35	13

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

Large firms were more likely to outsource Internet-based e-business logistics and customer relations functions: 23% did so for logistics and 35% did so for customer relations. The comparable rates for small firms were 9% and 11%, respectively.

An analysis of the outsourcing rates by industry reveals some major differences. The educational services sector has the highest outsourcing rate, 30%, two-and-a-half times the rate for all industries combined (Table 8).

Table 8
Firms outsourcing e-business logistics or customer relations functions, by industry, Canada, 2007

	percent
Agriculture, forestry, fishing and hunting	F
Mining and oil and gas extraction	2
Utilities	6
Construction	16
Manufacturing	13
Wholesale trade	13
Retail trade	12
Transportation and warehousing	5
Information and cultural industries	16
Finance and insurance	5
Real estate and rental and leasing	18
Professional, scientific and technical services	11
Management of companies and entreprises	20
Administrative and support, waste management and remediation services	13
Educational services	30
Health care and social assistance	5
Arts, entertainment and recreation	13
Accommodation and food services	13
Other services (except public administration)	16
All industries	12

Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

In summary, the majority of firms managed their e-business logistics and customer relations functions internally. Small firms were more likely to choose this strategic option. The systems used by small firms are probably not the same kind as those used by large firms, and many solutions tailored to the needs of smaller businesses do not require outside expertise or specialized equipment. That may not be the case for large firms. Although this study is about the management of specific functions associated with logistics, marketing and customer relations, the type of Internet application or system used may vary widely from company to company. The extent of their use may also vary. Outsourcing is sometimes seen as the most efficient way of managing the more complex solutions adopted by some large firms.

6 Sophistication of e-business processes

6.1 Selected approaches to studying the phenomenon

Up to this point, this study has examined the extent of e-business deployment in Canada using Internet-based systems, for either logistics functions or marketing and customer relations functions. The results show that in 2007, the adoption and integration of e-business methods of managing those business processes were still relatively uncommon. This has also been documented by other studies (Harland et al. 2007; Clayton and Goodridge 2004). On the other hand, the adoption rate and sophistication of e-business processes were increasing. Many factors can influence this adoption (Ranganathan et al. 2004). Researchers have put forward various models or approaches to explain the e-business adoption process (Forman and Goldfarb 2006). Two examples are the e-adoption ladder model and innovation theory.

According to the e-adoption ladder, firms generally adopt e-business processes in stages (Mendo and Fitzgerald 2005; OECD 2004; DTI 2004). Adoption of ICTs such as e-mail leads to more sophisticated Internet activity, such as e-commerce and e-business, and transformation of the organization through internal and external connection of its information systems (systems integration). The model suggests that e-business becomes more sophisticated as various e-business processes are deployed and systems are opened up to business partners. In one of its studies, the OECD proposes a similar theory to explain the degree of ICT adoption and sophistication in firms' business processes. The study identifies two different phases in the adoption of ICTs for business processes (OECD 2004). In the initial phase, ICTs are used to provide and search for information and subsequently for transactions (buying or selling on the Internet). In the second phase, the company incorporates ICTs into its internal and external processes (e.g. integration with suppliers' and customers' systems, integration of the company's own systems).

However, doubts have been raised about those theories. Some researchers argue that the adoption of some activities, such as e-commerce, is not a prerequisite for the adoption of more sophisticated e-business processes. As a result, many people have criticized the e-adoption ladder model's effectiveness in explaining the adoption of ICTs for e-business.

Some experts have adapted innovation diffusion theory to the context of ICTs and interorganizational systems (Ranganathan et al. 2004; Iacovou et al. 1995). This theory identifies the various phases of innovation, from initiation to adoption and ultimately to diffusion. By adapting the theory to interorganizational systems, some researchers have uncovered interesting features and differentiated between "assimilation" of Internet technologies and "diffusion" (Ranganathan et al. 2004). Assimilation is defined as the extent to which Internet technologies are used in the company's operations or business processes. Diffusion refers to the extent to which the company is integrated with business partners using Internet technologies. This is particularly interesting because, even though different terminology was being used, the distinction is something this study has examined.

6.2 E-business adoption in Canada

The theories advanced to explain e-business adoption provide some ideas on how to determine the level of sophistication of those processes.

E-business sophistication has been said to depend primarily on the degree of assimilation of Internet technologies, reflected in part in the diversity of the e-business processes deployed (Raymond et al. 2005). For some, the assimilation of Internet technologies may be influenced by cumulative learning and experience (Chatterjee et al. 2002; Rosenwig and Roth, 2007). Firms may acquire some initial experience with the Internet's potential for e-business by engaging in e-commerce and then move on to other capabilities such as e-business logistics. The reverse is also possible, as firms using e-business logistics could take advantage of their experience to expand into e-commerce. It is possible as well that firms that engage in a variety of activities—in this case, a variety of e-business processes—have an environment that is more conducive to innovation. Organizations that have a greater propensity to innovate through technology are those for which organizational learning is less of a burden

(Fichman and Kemerer 1997). Firms that have used e-business for certain processes (e.g. e-commerce) are likely to be in a better position to assimilate other e-business processes.

Another component of sophistication is the integration of e-business processes (Raymond et al. 2009). This integration can take place between systems within a company (internal) or with business partners' systems (external). The distinction between adoption and integration of e-business processes—for logistics and customer relations—seems important in the context of e-business sophistication. The factors that influence e-business adoption are not necessarily the same as the ones that influence external integration, for example[6] (Ranganathan et al. 2004).

Below, the level of e-business sophistication[7] in Canada is examined using the data provided by the SECT.

6.3 Proportion of firms that use more than one e-business process

Table 9 is a cross-tabulation that shows the breakdown of firms based on whether they use various e-business processes or not. It can be seen that aside from the firms that do not do business online (46.3%), the firms that engage in e-commerce but do not use e-business processes for logistics or customer relations made up the largest percentage (35.4%). A much smaller percentage used e-business for logistics or customer relations but did not do e-commerce (3.4%). Firms that take a more diversified approach, engaging in e-commerce and using e-business processes for logistics and customer relations, accounted for 3.7% of the population.

Table 9
Firms that combined e-business processes, Canada, 2007

	percent
Customer relations (only)	**1.4**
Logistics (only)	**1.5**
With customer relations	0.5
E-commerce (only)	**35.4**
With customer relations	5.6
With logistics	5.6
With customer relations and logistics	3.7
None	46.3
Total	**100.0**

Note(s): Categories are mutually exclusive. For instance, 1.5% of firms used e-business for logistics but did not use e-commerce and e-business for customer relations.
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

At first glance, e-commerce appeared to be a more common business process than e-business logistics and e-business customer relations. However, the picture looks quite different when the two components of e-commerce, online buying and selling, are examined. It is known that fewer firms sell online than buy online (Statistics Canada 2008).

Table 10 provides a breakdown of firms by e-business use, including those which sell online and those which do not. As the table shows, most Canadian firms (78.2%) did not sell online and did not use e-business processes for logistics or customer relations. In addition, 3.5% of firms sold online but did not use e-business for logistics or customer relations. Conversely, 13.8% of firms used e-business for logistics or customer relations but did not sell online.

The latter phenomenon is undoubtedly due in part to the complexity and high cost of deploying online sales infrastructure. Online selling usually requires a secure system linked in some way to inventory management,

6. This study also looks at internal integration of systems, i.e. the existence of automatic links to the company's back-end systems.
7. With regard to e-business sophistication, the diversity of the business processes involved and the integration of those processes, intensity of use is also important (for example, number of clients integrated or linked to systems). However, this research does not cover that aspect.

whereas online purchasing is often just a matter of placing orders through a supplier's website. In other words, online selling can be more complex and cumbersome than e-business logistics, for example, depending on the context in which those activities are conducted.

Table 10
Firms that combined e-business processes, detailed with online selling, Canada, 2007

	percent
Customer relations (only)	**4.9**
Logistics (only)	**6.2**
With customer relations	2.7
Online selling (only)	**3.5**
With customer relations	2.2
With logistics	0.8
With customer relations and logistics	1.5
None	78.2
Total	**100.0**

Note(s): Categories are mutually exclusive. For instance, 6.2% of firms used e-business for logistics but did not use online selling and e-business for customer relations.
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

With regard to e-business logistics or customer relations processes, an important aspect of using the Internet to manage these processes is potential integration with other systems. In a sense, systems integration can be regarded as a higher level of sophistication than mere adoption of systems for managing various business processes. As seen in an earlier section, not all firms that use e-business for logistics or customer relations integrate their systems. Table 11 shows the percentage of businesses that used both e-commerce and other business processes and have integrated or linked systems.[8] In this study, the highest level of sophistication involves engaging in e-commerce and using integrated systems for e-business logistics and customer relations functions. In Canada, 1.5% of firms met these criteria.

Table 11
Firms that combined integrated e-business processes, selected combinations, Canada, 2007

	percent
E-commerce, Logistics (linked), Customer relations (linked)	1.5
E-commerce, Logistics (linked)	4.2
E-commerce, Customer relations (linked)	3.6

Note(s): Categories are not mutually exclusive.
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

6.4 Association between e-commerce and e-business for logistics and customer relations

One of the study's objectives is to determine whether firms that engaged in e-commerce were more likely to use e-business for other business processes. To answer this question, some cross-tabulations for Canadian firms that have adopted e-business for logistics and customer relations are presented, showing the proportion engaging in e-commerce and the proportion that does not. The tables also provide breakdowns by company size.

The figures in Table 12 indicate that a greater proportion of firms of all sizes that buy online used e-business for either logistics or customer relations than did firms not buying online. For example, 18% of firms that buy online use e-business for logistics, compared with 5% that do not. The same was true for firms selling online compared with

8. Not all possible combinations are shown.

those not selling online. It is also interesting to examine these results across firm size. In general, the proportions of mid-sized and large firms engaging in e-commerce and using e-business for logistics or customer relations was higher than those of small firms for the same activities.

In addition, those mid-sized and large firms buying online (25%) were 2.41[9] times more likely to use e-business for logistics than those not buying online (12%).[10] In the case of small firms, those buying online (17%) were 5.01 times more likely to use e-business for logistics than those not buying online (4%).[11] Proportionally, the difference is greater for small firms than for mid-sized and large firms.[12]

Table 12
Adoption of e-business for logistics and customer relations, by use or non-use of e-commerce, Canada, 2007

	Logistics	Customer relations
	percent	
Total		
Does not sell online (reference group)	10	8
Online selling	29**	46**
Does not buy online (reference group)	5	5
Buying online	18**	18**
Small		
Does not sell online (reference group)	8	7
Online selling	27**	43**
Does not buy online (reference group)	4	5
Buying online	17**	16**
Mid-sized/large		
Does not sell online (reference group)	19	15
Online selling	36**	58**
Does not buy online (reference group)	12	9
Buying online	25**	26**

** The difference from the reference group is statistically significant at the 99% confidence level ($p < 0.01$)
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

6.5 Association between e-commerce and integration of e-business for logistics and marketing and customer relations

In addition to examining the adoption of e-business for logistics and customer relations functions, this study looks at the integration of e-business logistics and customer relations systems. To measure that phenomenon, we use the existence of automatic links between systems within the organization (internal) and automatic links with customers' and/or suppliers' systems (external).

Taking the same approach as in the previous section, we determined whether firms that engage in e-commerce were more likely to integrate their e-business logistics or customer relations systems.

As shown in Table 13,[13] the association between the adoption of e-commerce and the integration of e-business is not as clear-cut as the association between the use of e-commerce and the adoption of e-business (Table 12).

9. These probabilities are expressed as odds ratios.
10. It is important to keep in mind that the association between e-commerce and the adoption of other e-business processes such as logistics is not a cause-and-effect relationship and that the order in which processes are adopted may vary from company to company.
11. The pattern is the same for firms that sell online compared with firms that do not sell online. The probability of using e-business for logistics is 2.41 for small firms and 4 for mid-sized and large firms.
12. To measure these differences, we performed regression analyses in which one interaction term composed of company size and the e-commerce variables (buying or selling online) was inserted in the model. The interaction term proved to be significant, which confirmed the differences depending on company size.
13. We also studied the marketing and customer relations functions, but because few firms integrate those functions externally, only conclusions concerning the external integration of logistics functions are presented here.

These findings are consistent with the results of other studies that concluded that the factors which influence the use of Internet technologies for e-business are not necessarily the same as the factors that influence integration with customers or suppliers (Ranganathan et al. 2004).

Sectoral characteristics and factors not studied here, such as the power relationship or interdependencies between partners, need to be examined in greater detail to get a clearer picture of what influences the external integration of Internet-based systems used to manage processes such as logistics.

Table 13
Integration of e-business for logistics and customer relations, by use or non-use of e-commerce, Canada, 2007

	Logistics, External integration	Logistics, Internal integration	Customer relations, Internal integration
	percent		
Total			
Does not sell online (reference group)	31	24	28
Online selling	33	34*	39*
Does not buy online (reference group)	25	27	28
Buying online	33	26	33
Small			
Does not sell online (reference group)	29	20	26
Online selling	32	32*	36*
Does not buy online (reference group)	27	23	26
Buying online	30	22	30
Mid-sized/large			
Does not sell online (reference group)	36	39	38
Online selling	36	37	49
Does not buy online (reference group)	16	44	37
Buying online	40**	38	42

* The difference from the reference group is statistically significant at the 95% confidence level ($p < 0.05$)
** The difference from the reference group is statistically significant at the 99% confidence level ($p < 0.01$)
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

6.6 Association between firms that used e-business for customer relations and firms that used e-business for logistics

Up to now, we have been trying to understand the association between the adoption of e-commerce and other business processes such as logistics and customer relations. Table 14 shows the adoption of e-business for logistics by adoption or non-adoption of e-business for customer relations. The figures indicate that firms using e-business for customer relations were more likely to use e-business for logistics than firms not using e-business for customer relations.

Table 14
Adoption of e-business for logistics by adoption or non-adoption of e-business for customer relations, Canada, 2007

	Logistics
	percent
Total	
Does not use e-business for customer relations (reference group)	8
Uses e-business for customer relations	37**
Small	
Does not use e-business for customer relations (reference group)	7
Uses e-business for customer relations	36**
Mid-sized/large	
Does not use e-business for customer relations (reference group)	16
Uses e-business for customer relations	41**

** The difference from the reference group is statistically significant at the 99% confidence level ($p < 0.01$)
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

7 The benefits of doing business over the Internet, based on business activities

The 2007 Survey of Electronic Commerce and Technology (SECT) asked Canadian firms about the perceived benefits of doing business over the Internet. Previous versions of the survey also provided information on the perceived benefits of doing business over the Internet (Uhrbach 2007). For the first time, the question can be studied in relation to the sophistication of their e-business processes.

To that end, Canadian firms were divided into five different categories (mutually exclusive) of Internet use for e-business:

1. Does not use e-commerce (buying or selling online) and does not use Internet-based systems to manage logistics;
2. Uses e-commerce, but does not use Internet-based system to manage logistics functions;
3. Uses a non-integrated Internet-based system to manage logistics, but does not use e-commerce;
4. Uses an internally or externally integrated Internet-based system to manage logistics, but does not use e-commerce;
5. Uses e-commerce, and uses a non-integrated Internet-based system to manage logistics;
6. Uses e-commerce, and uses an internally or externally integrated Internet-based system to manage logistics.

The results presented in Table 15 show that in general, firms doing business over the Internet were more likely to observe the benefits associated with doing business over the Internet than firms not doing business over the Internet. Firms engaging in more activities on the Internet were more likely to perceive a benefit. A greater proportion of firms that both engage in e-commerce and manage logistics online (integrated or not) observed benefits than firms only engaging in e-commerce.

Table 15
Perceived benefits of doing business over the Internet by selected types of Internet activities, 2007

	No business over the Internet	E-commerce only (reference group)	Logistics only over the Internet, non-integrated	Logistics only over the Internet, integrated	E-commerce and logistics over the Internet, non-integrated	E-commerce and logistics over the Internet, integrated
	percent					
Lower costs	8**	41	27*	19**	51**	48*
Reach potential customers	15**	44	40	31	57**	57**
Better coordination with customers, suppliers and partners	11**	47	45	39 E	65**	69**
Reduced time to market	5**	26	15*	19	32**	40**

* The difference from the reference group is statistically significant at the 95% confidence level ($p < 0.05$)
** The difference from the reference group is statistically significant at the 99% confidence level ($p < 0.01$)
Note(s): The reference group used in this table is the group of companies that engage only in e-commerce.
Source(s): Statistics Canada, Survey of Electronic Commerce and Technology, 2007.

For firms that both engage in e-commerce and manage logistics online (integrated)[14] compared to firms that only engaged in e-commerce, the smallest difference in percentage points was for cost reduction between the group "E-commerce and logistics over the Internet, integrated" (48 %) and "E-commerce only (reference group)" (41 %). That may be due to the difficulty for firms in measuring the savings achieved by integrating e-business management systems. First, it may take several years to realize those savings. Second, the savings may not be made directly but through other benefits, such as better coordination with suppliers, for example (Deveraj et al. 2007). Third, deployment of the technologies is not a sufficient condition for success (Baldwin and Sabourin 2002; Gu and Gera, 2004; Raymond et al. 2009). The success of such an investment may be influenced by a number of organizational factors, and integration intensity, which is not measured in our survey, may be a factor.

8 Summary

This study has shown that the adoption of e-business for logistics and customer relations was not yet widespread in Canada. A low adoption rate has been observed in a number of countries (OECD 2004). Mid-sized and large firms seemed to be better positioned than small firms to use Internet-based systems to manage those business processes. This study examined the internal and external integration of those systems in terms of the existence of automatic links to back-end systems within the organization (internal integration) and the presence of automatic links to customers' or suppliers' systems (external integration). It can be seen that internal integration is more common than external integration, particularly in the case of e-business for customer relations. The results by company size show that the majority of large firms that use e-business for either logistics or customer relations integrated those systems internally. The majority of small and mid-sized firms did not. With regard to external integration, Internet-based logistics systems were integrated mostly with suppliers, a trend that has been seen in other countries (Clayton and Goodridge 2004; OECD 2004). For functions associated with customer relations, however, the picture is less clear-cut. Proportionally speaking, the number of firms that integrated their Internet-based systems with supplier's systems was approximately the same as those who integrated them with their customers' system.

This study also looked at the sophistication of e-business processes in Canada. Almost half of Canadian firms (46.3%) did not engage in e-commerce and did not use e-business for logistics and customer relations. At the other end of the spectrum, 3.7% of Canadian firms used both e-commerce and e-business for logistics and customer relations.

This study also attempted to determine whether e-commerce was associated with the adoption of other e-business processes and the integration of those business processes. The study has shown that depending on company size,

14. The last column of Table 15.

firms engaged in online buying and selling on the Internet were more likely to use an Internet-based system for e-business logistics and customer relations than firms not engaged in buying or selling online.

Firms that engaged in e-commerce or used Internet-based systems to manage logistics functions clearly perceived benefits from doing business online compared with firms that do not engage in those activities. Furthermore, proportionally more firms using Internet-based business processes such as e-commerce and logistics tended to see benefits in doing business online than firms that engaged in e-commerce only.

In conclusion, firms have various reasons for accepting or rejecting e-business for managing functions such as logistics and customer relations. This study has provided a snapshot of the Canadian situation with regard to the deployment of e-business and the level of integration of Internet-based systems for the various processes concerned. Moreover, in a context where it is becoming more clear that firms that adopt a variety of e-business processes create an environment that is more conducive to innovation, this study provides a better understanding of the impact of such business practices. Yet it has only scratched the surface. It will be important to examine the effect that e-business has on company performance, especially productivity. According to many researchers, ICTs are an important factor in improving productivity (Council of Canadian Academies 2009), and some studies (Franklin et al., 2008) have attempted to measure their impact with linked data on company characteristics, use of ICTs and financial performance. It would also be useful to look at the organizational context in which the technologies are deployed.

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